# LA-UR-23-21023

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| **Title:** | Double cylinder shot day at OMEGA (CylDRT22B) May 26 2022 |
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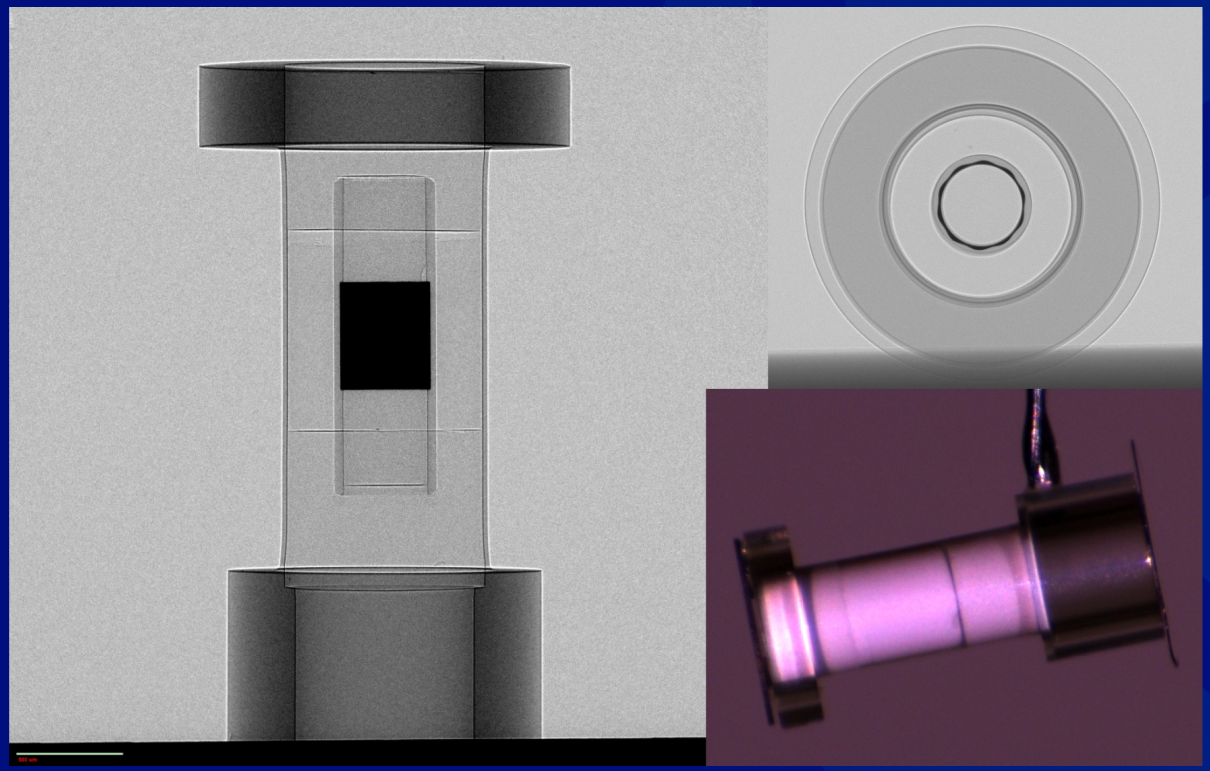
Los Alamos NATIONAL LABORATORY

LA-UR-23-XXXXX

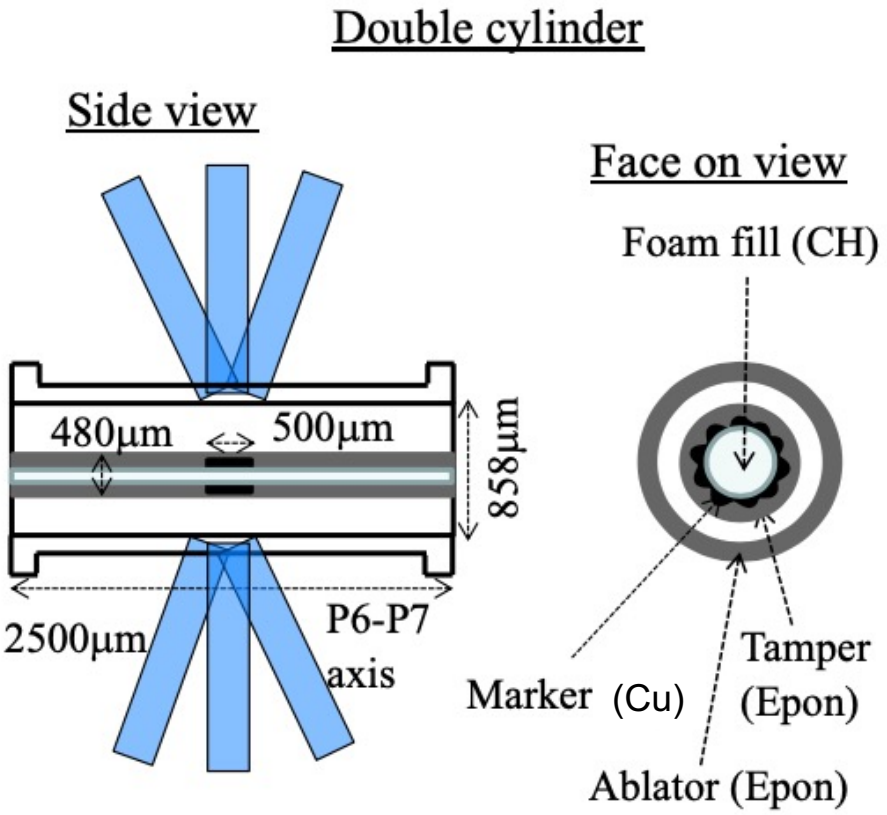
# Double cylinder shot day at OMEGA (CylDRT22B) May 26 2022

R. Roycroft, S. Palaniyappan, J. P. Sauppe, and the cylinders team

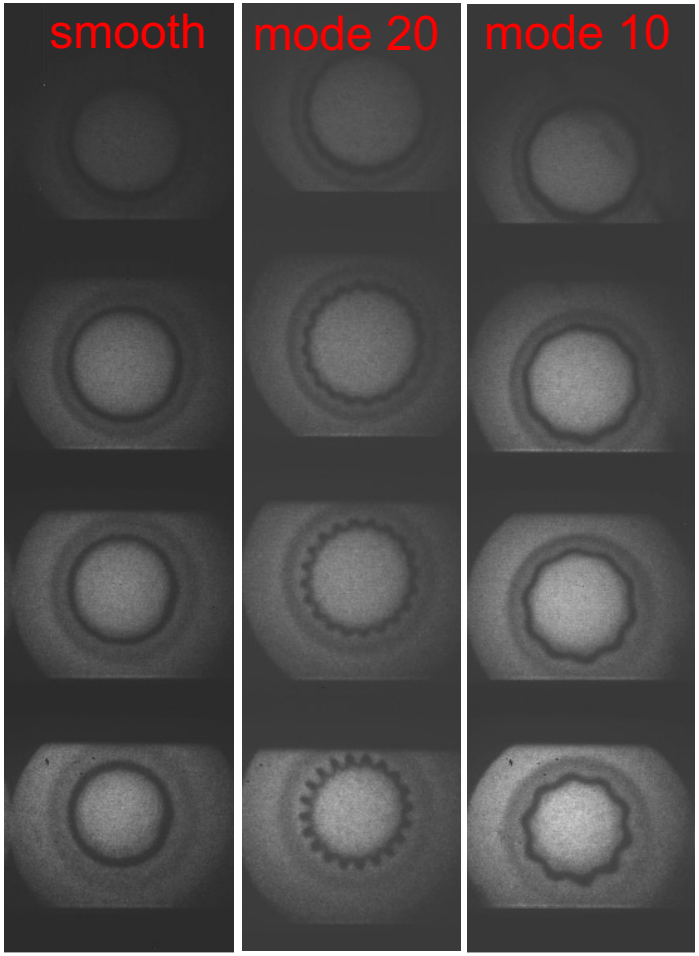


# This was the first shot day for double cylinders

- Goal for shot day: observe convergence and growth of pre-seeded perturbations on the inner cylinder, the outer surface of which is classically Rayleigh-Taylor unstable during the acceleration phase
- Total of 12 shots:
  - 3 smooth
  - 4 mode-10
  - 5 mode-20
- Fielded both backlighter and sidelighter diagnostics
- Successfully imaged the inner cylinder throughout the implosion



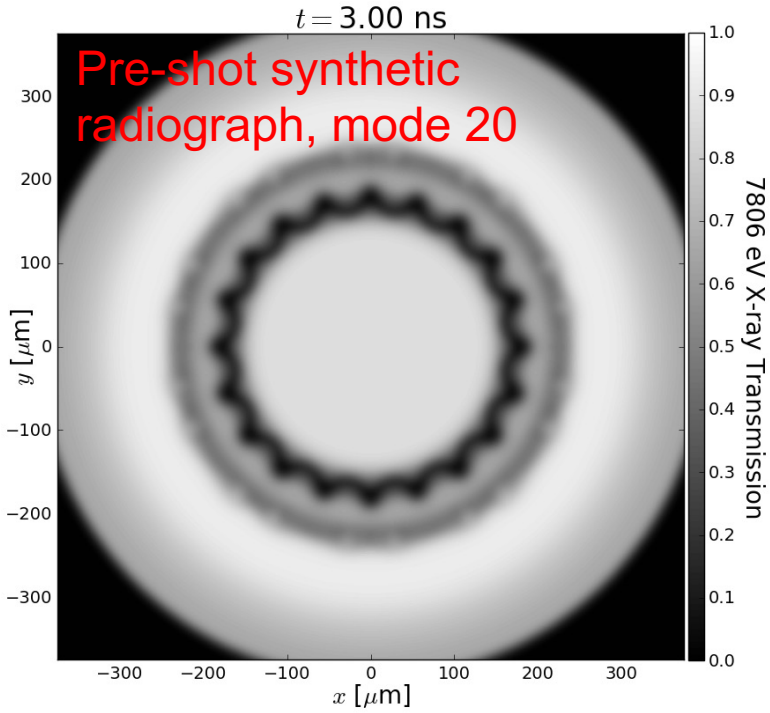
# Backlighter Images




time

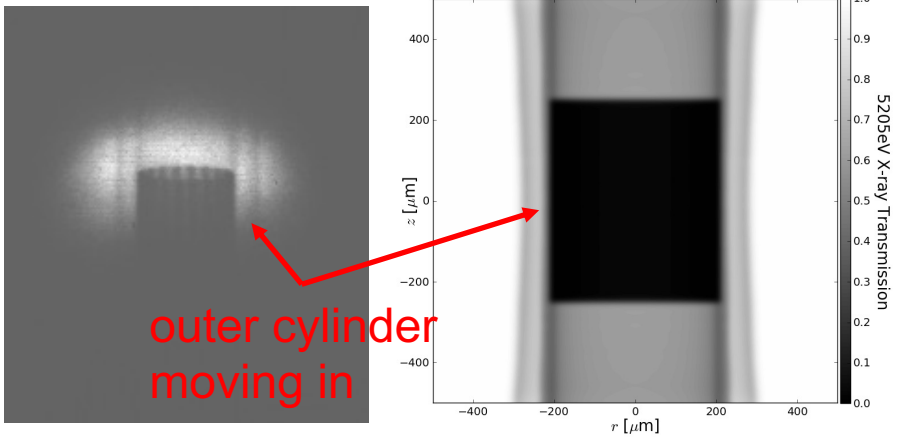
Timing: 2.5 – 3.5 ns

- Implosion was a little slower than in pre-shot calculations – one reason could be that the laser energy delivered on shot was closer to 430 J, while we did all the design simulations with 450 J (and an 80% *ad hoc* laser power multiplier)
- We saw mode growth for all 3 target types at 3 timing windows
- The 2.5 – 3.5 ns timing window captures the beginning of the instability growth, during the inner cylinder's acceleration phase



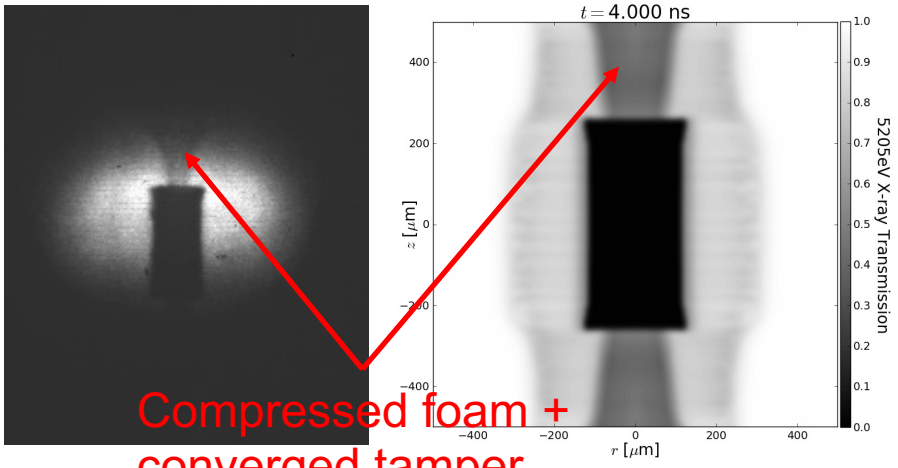
# Sidelighter Images

- The spikes on the perturbed targets are visible in side-lit images as well
- The sidelighter sees some of the less dark features from the pre shot synthetic radiographs, such as the outer cylinder as it collides with the inner cylinder, and the compressed CH in the inner cylinder




Mode 20 target
Timing: 2.0 ns

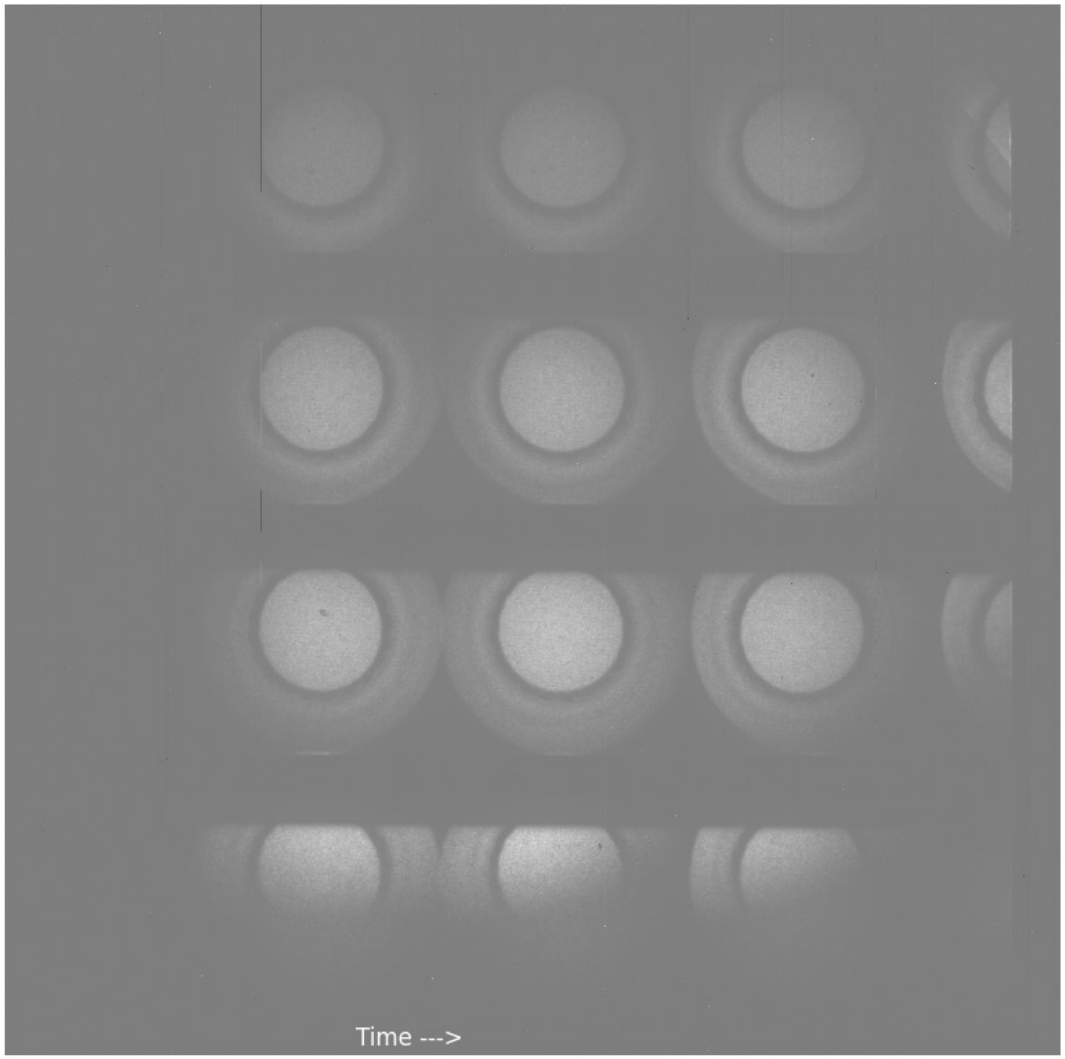
Pre shot synthetic radiograph
(RZ simulation)



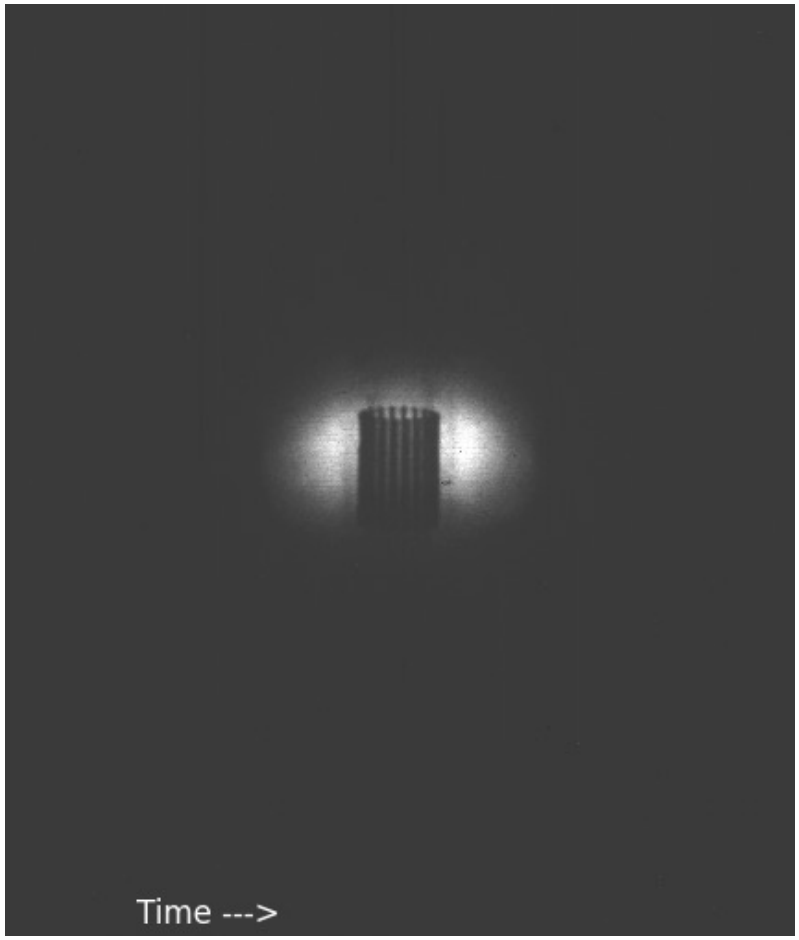

Smooth target
Timing: 4.0 ns

Pre shot synthetic radiograph
(RZ simulation)

# Shot 104419 – target 5 red m20 (SL target 1 silver), avg drive energy 429J on target

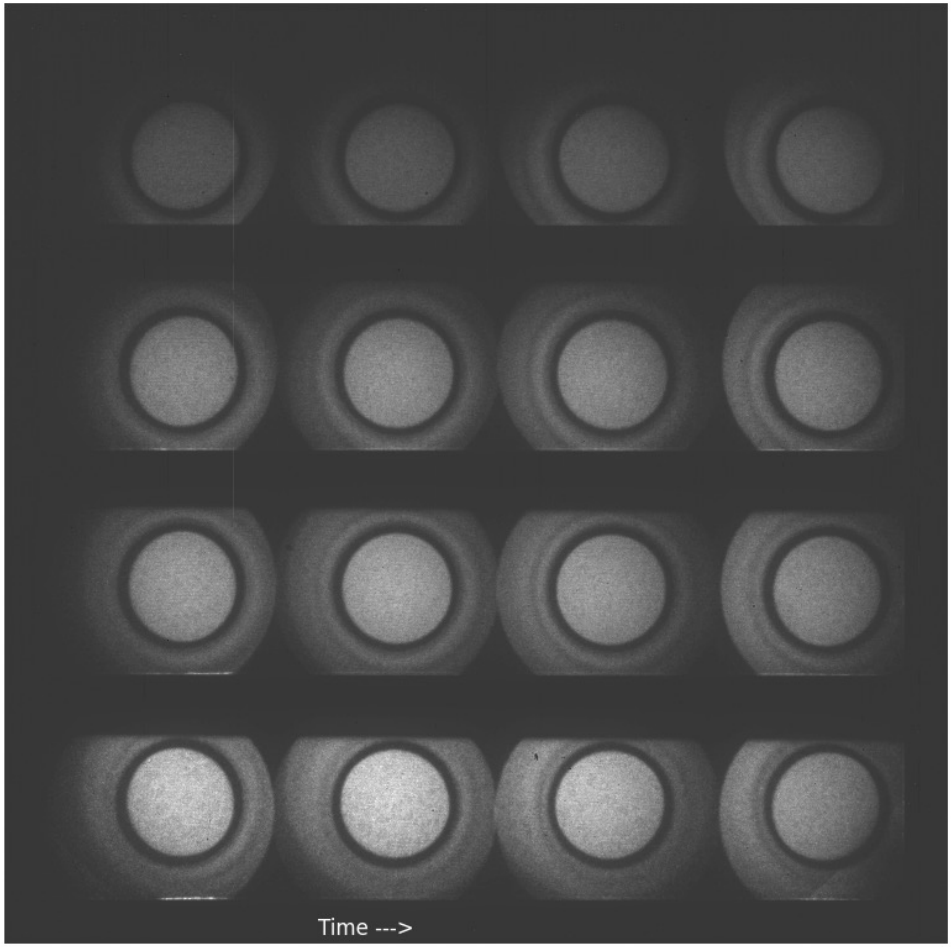



Timing: 1.5 – 2.5 ns

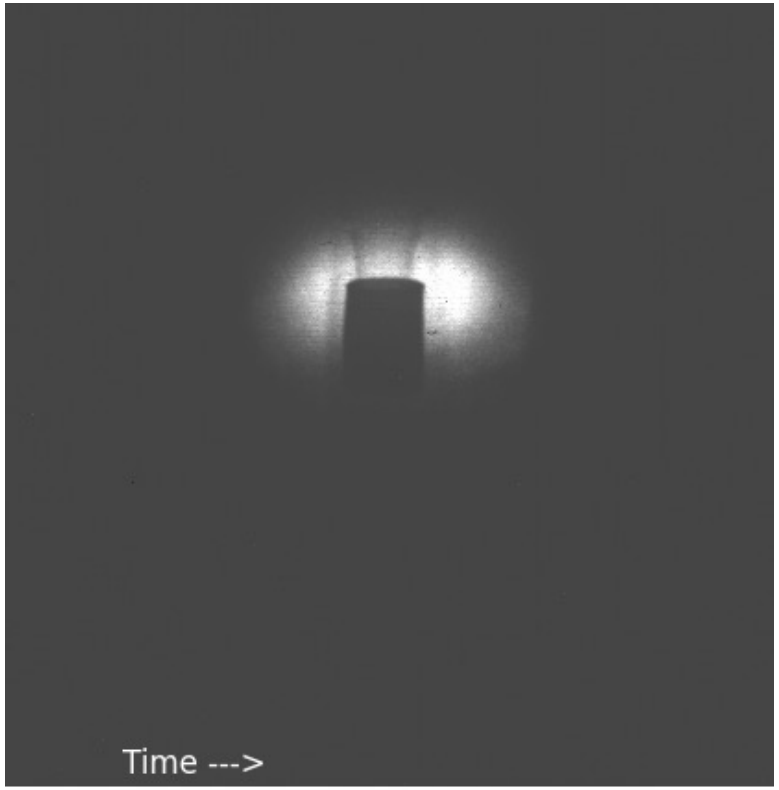



Timing: 3.0 ns

Shot 104420 – target 1 white smooth (SL target 2 silver),
avg drive energy 437J on target

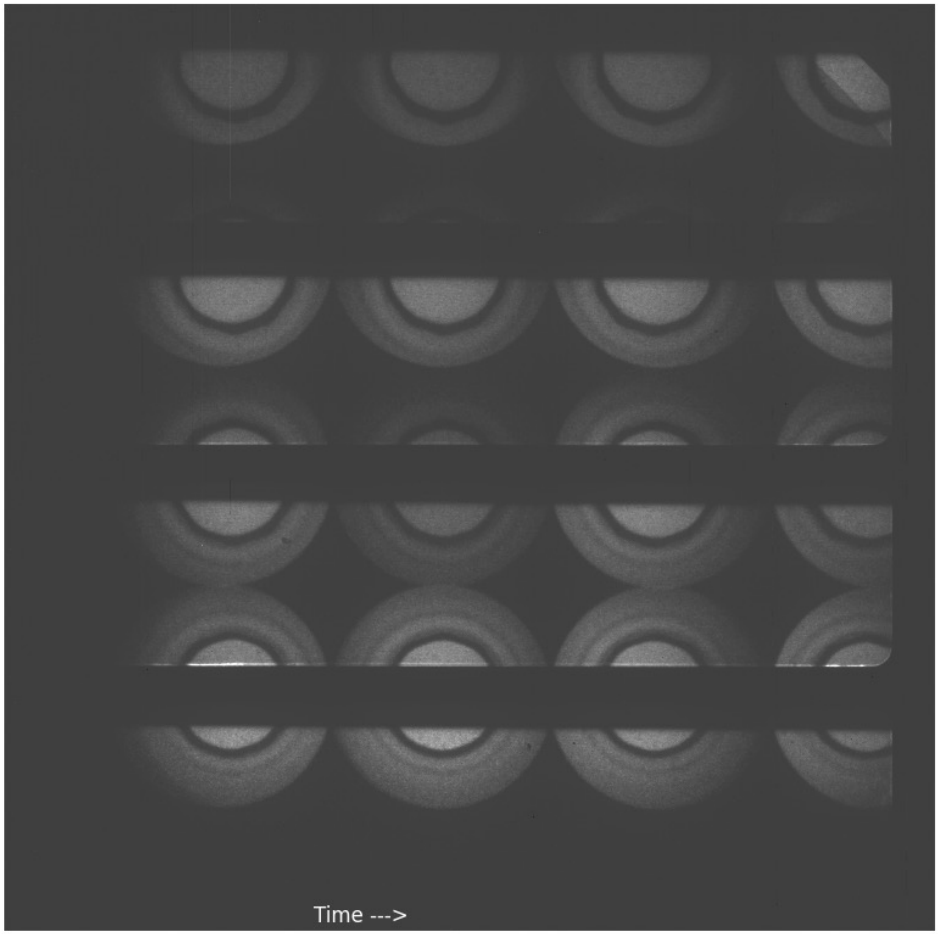



Timing: 1.5 – 2.5 ns




Timing: 3.0 ns

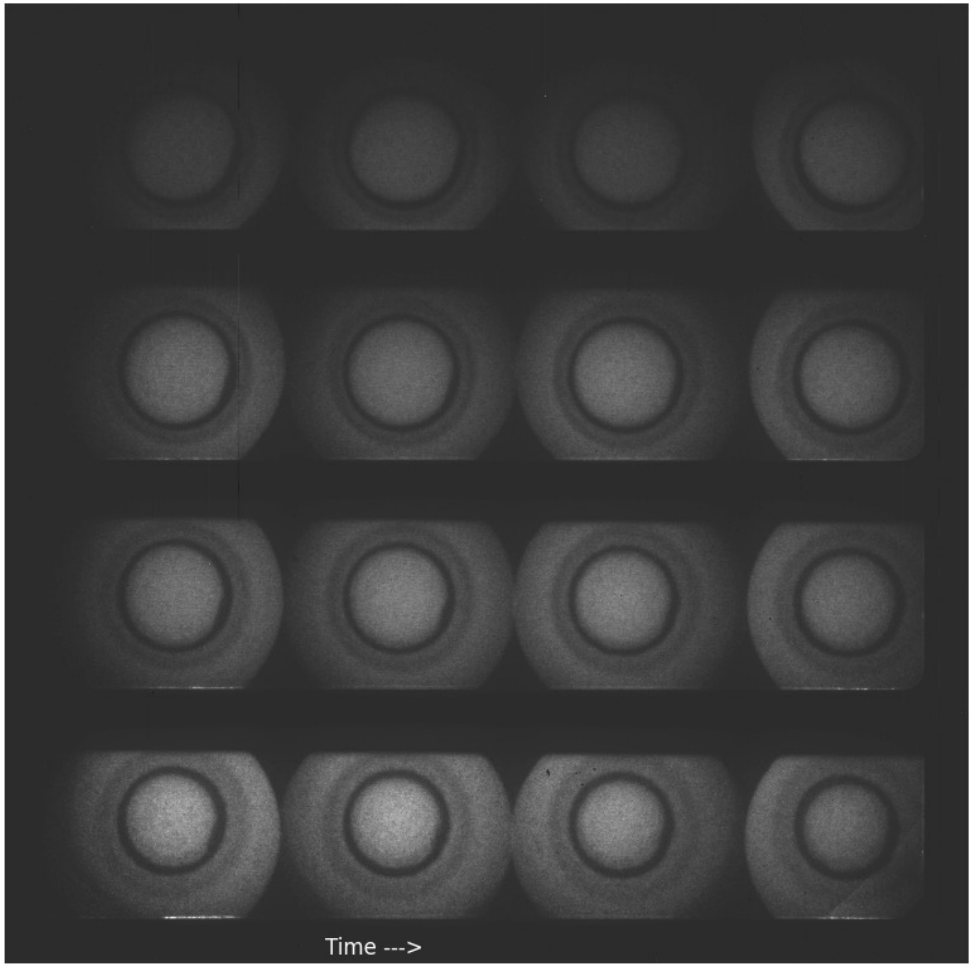
Shot 104421 – target 1 pink m10 (SL target 4 silver),
avg drive energy 429.8 J on target




Timing: 1.5 – 2.5 ns


Timing: 3.0 ns

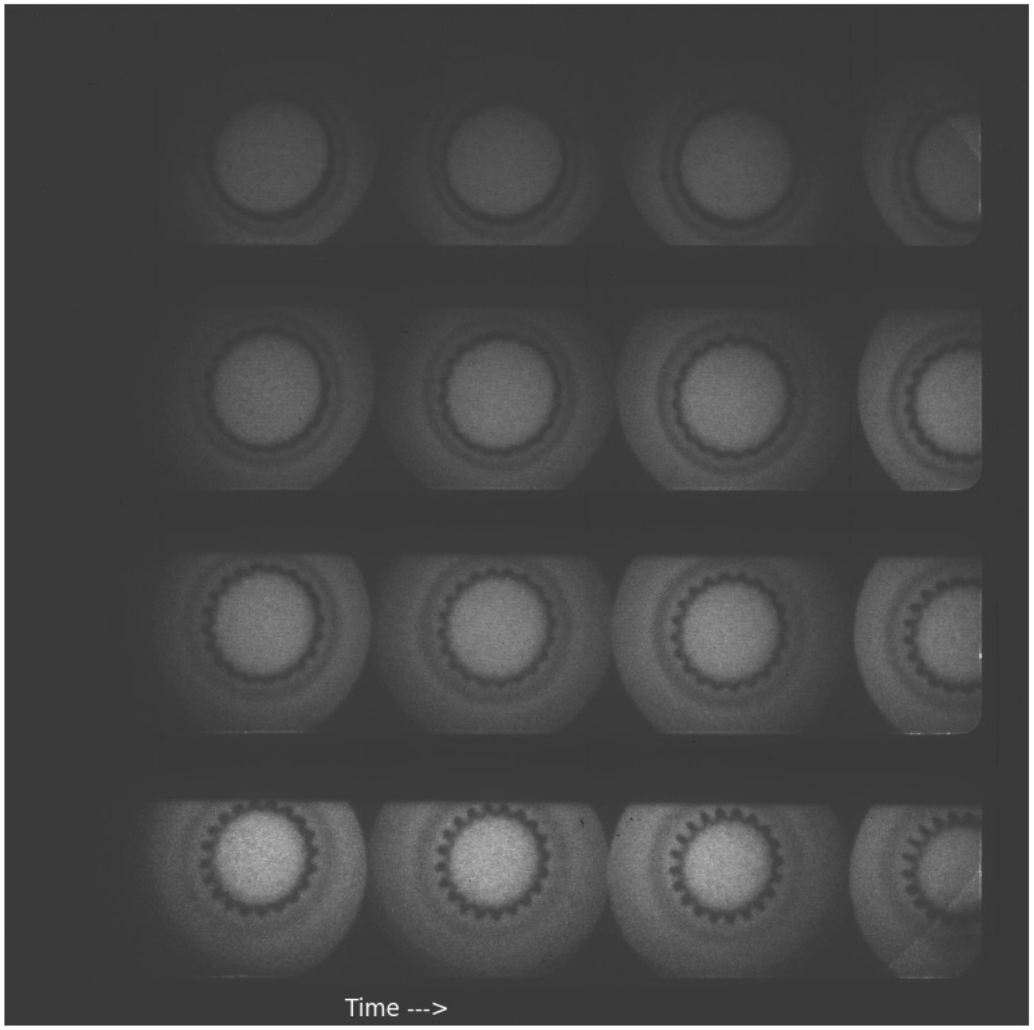
Shot 104422 – target 4 white (SL target 5 silver),
avg drive energy 428.7 J on target



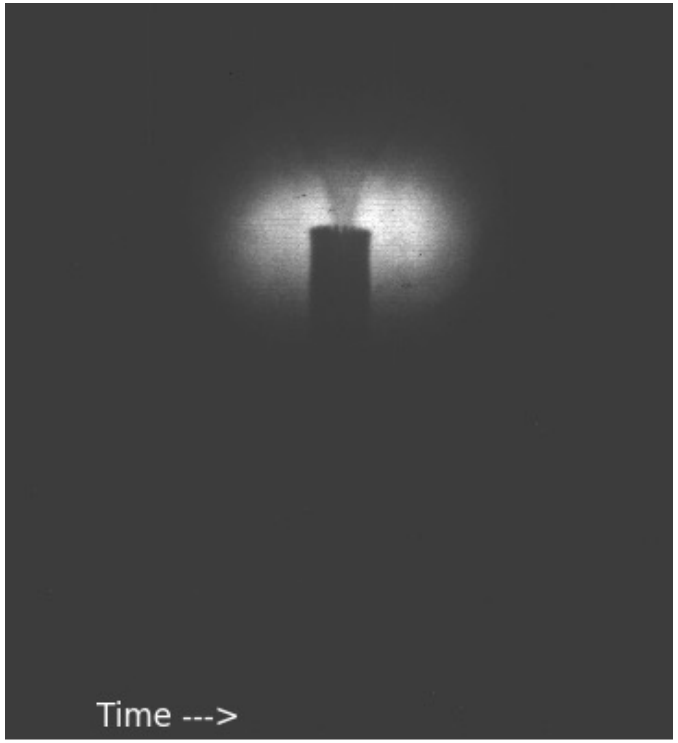

Timing: 2.5 – 3.5 ns


Timing: 4.0 ns

Shot 104423 – target 2 red (SL target 6 silver), avg drive energy 426.9 J on target

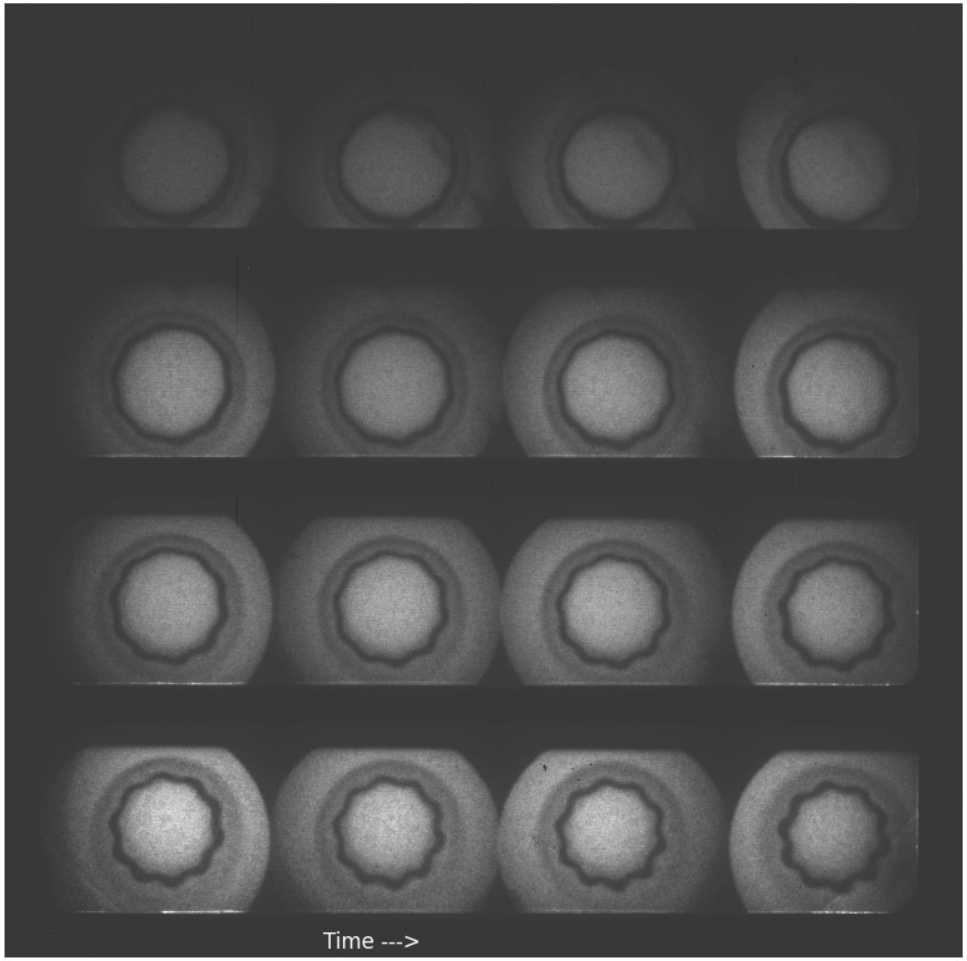



Timing: 2.5 – 3.5 ns

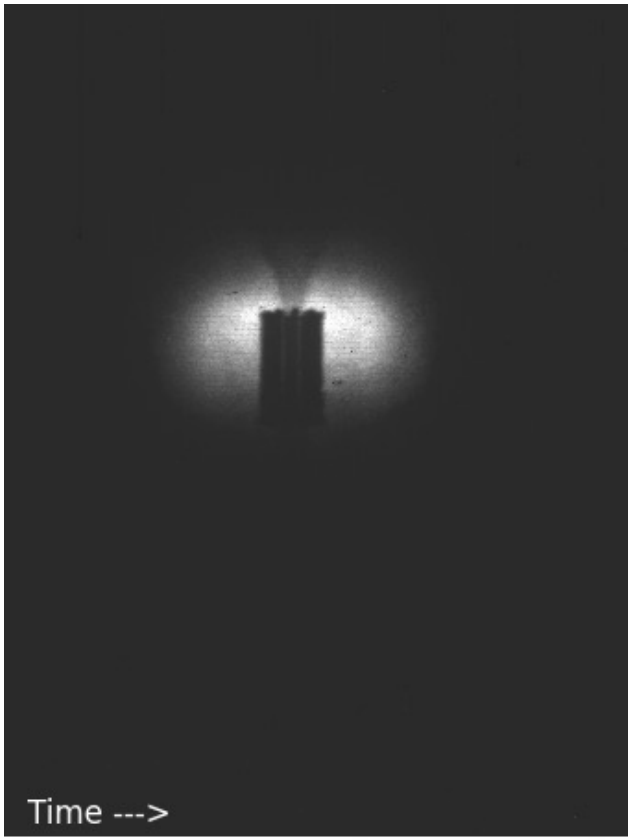



Timing: 4.0 ns

Shot 104424 – target 2 pink (SL target 7 silver),
avg drive energy 433.9 J on target

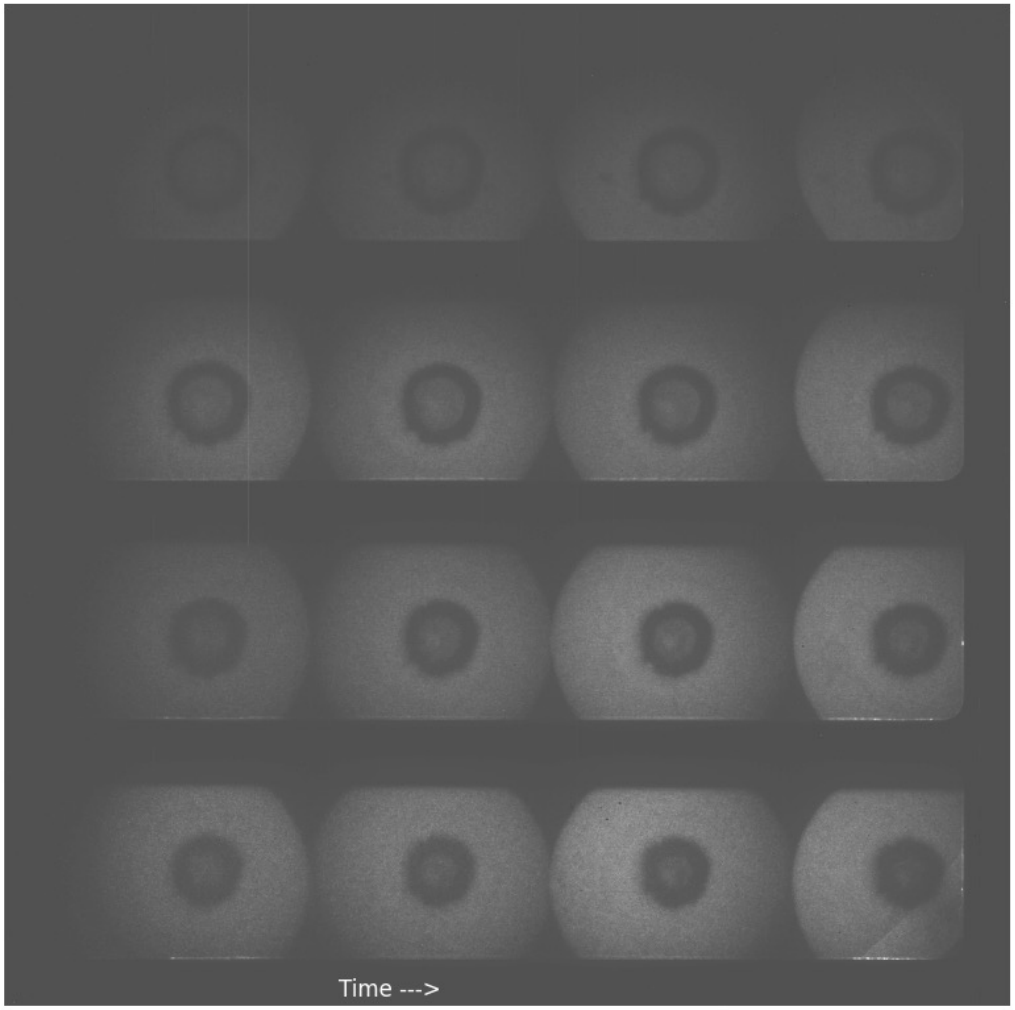



Timing: 2.5 – 3.5 ns

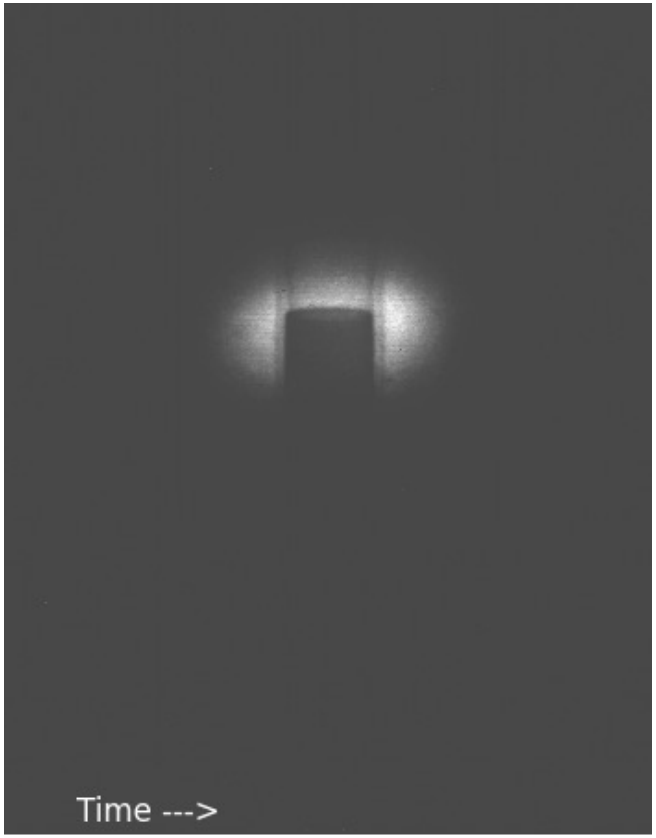



Timing: 4.0 ns

Shot 104425 – target 5 white (SL target 8 silver), avg drive energy 431.7 J on target

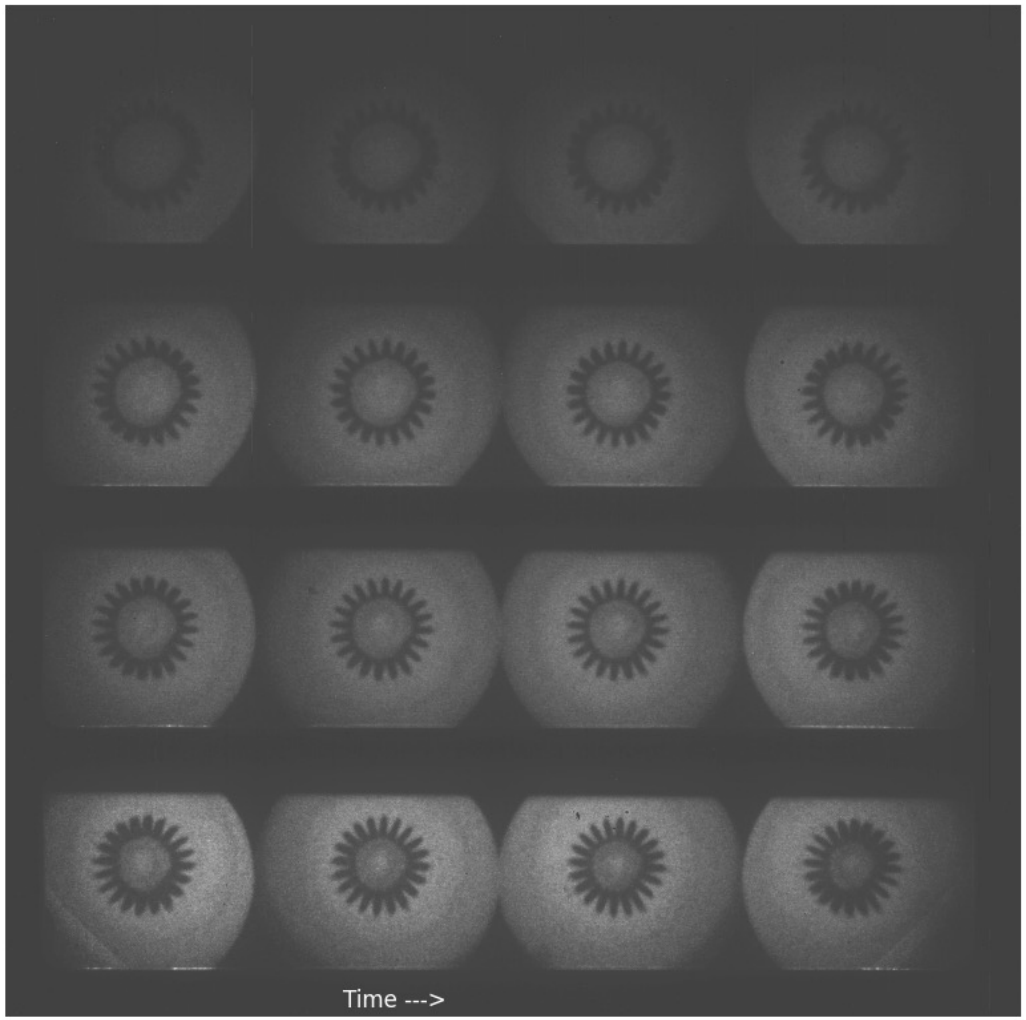



Timing: 4.0 – 5.0 ns




Timing: 2.5 ns

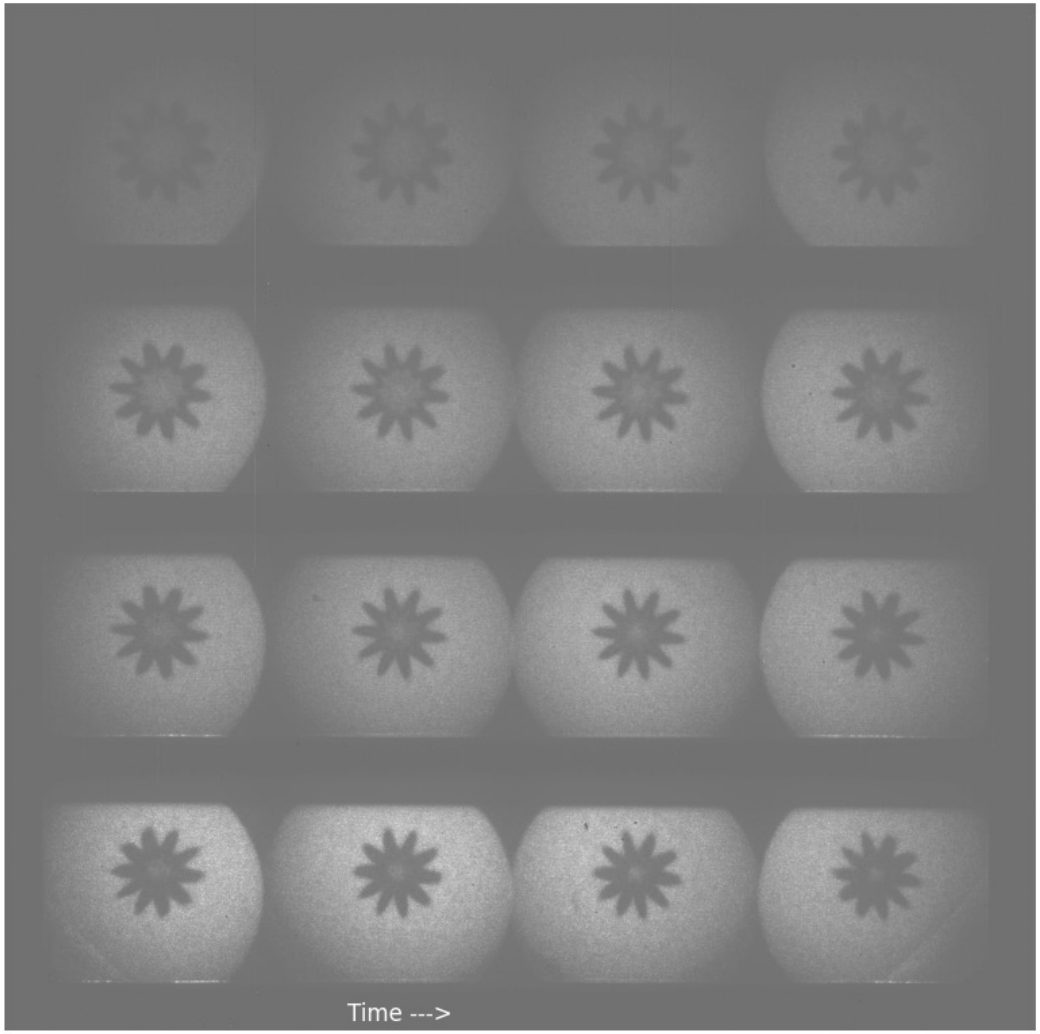
Shot 104426 – target 3 red (SL target 9 silver), avg drive energy 432.3 J on target



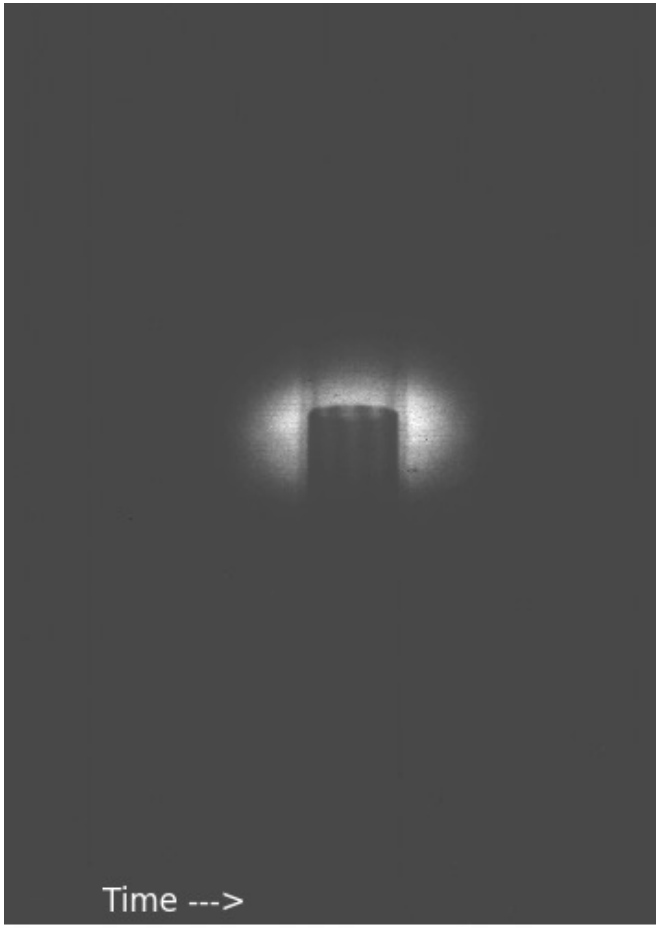

Timing: 4.0 – 5.0 ns


Timing: 2.5 ns

Shot 104427 – target 5 pink (SL target 10 silver), avg drive energy 435.1 J on target

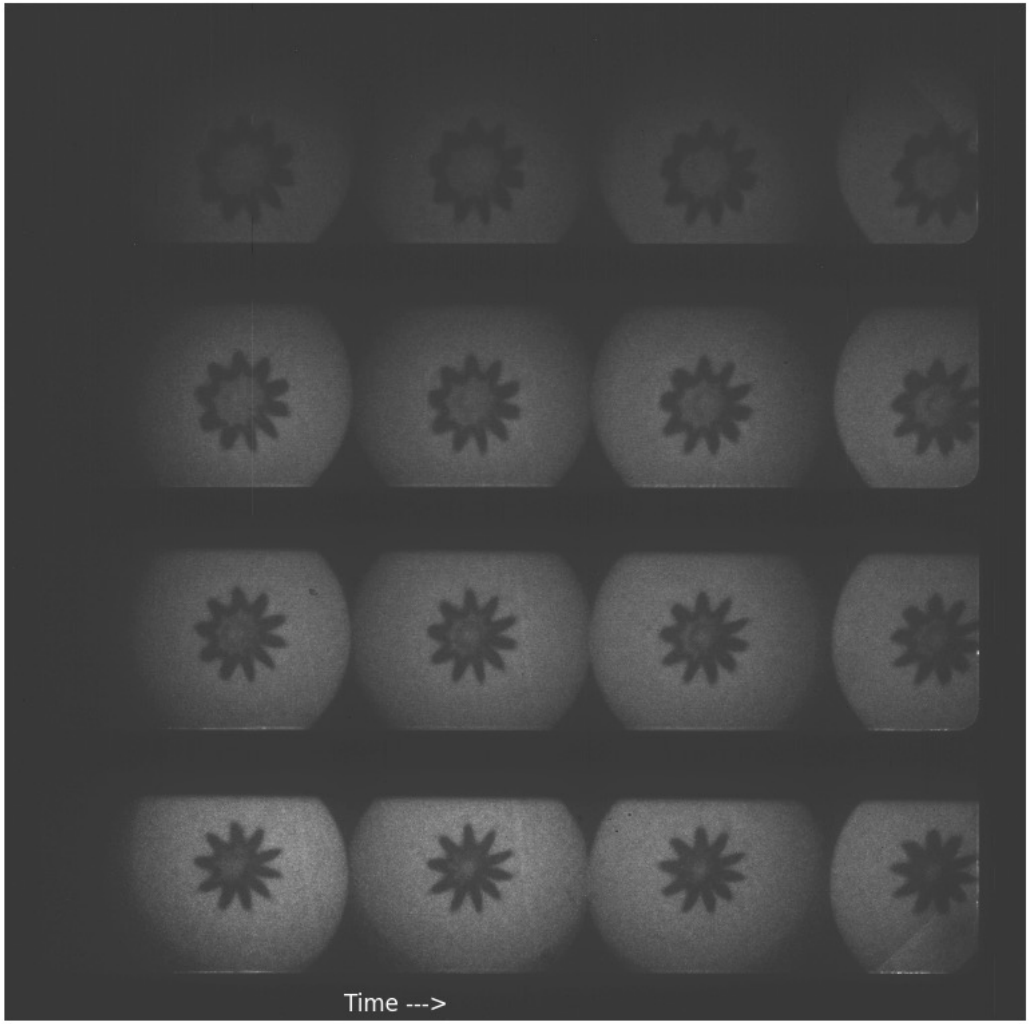



Timing: 4.0 – 5.0 ns




Timing: 2.5 ns

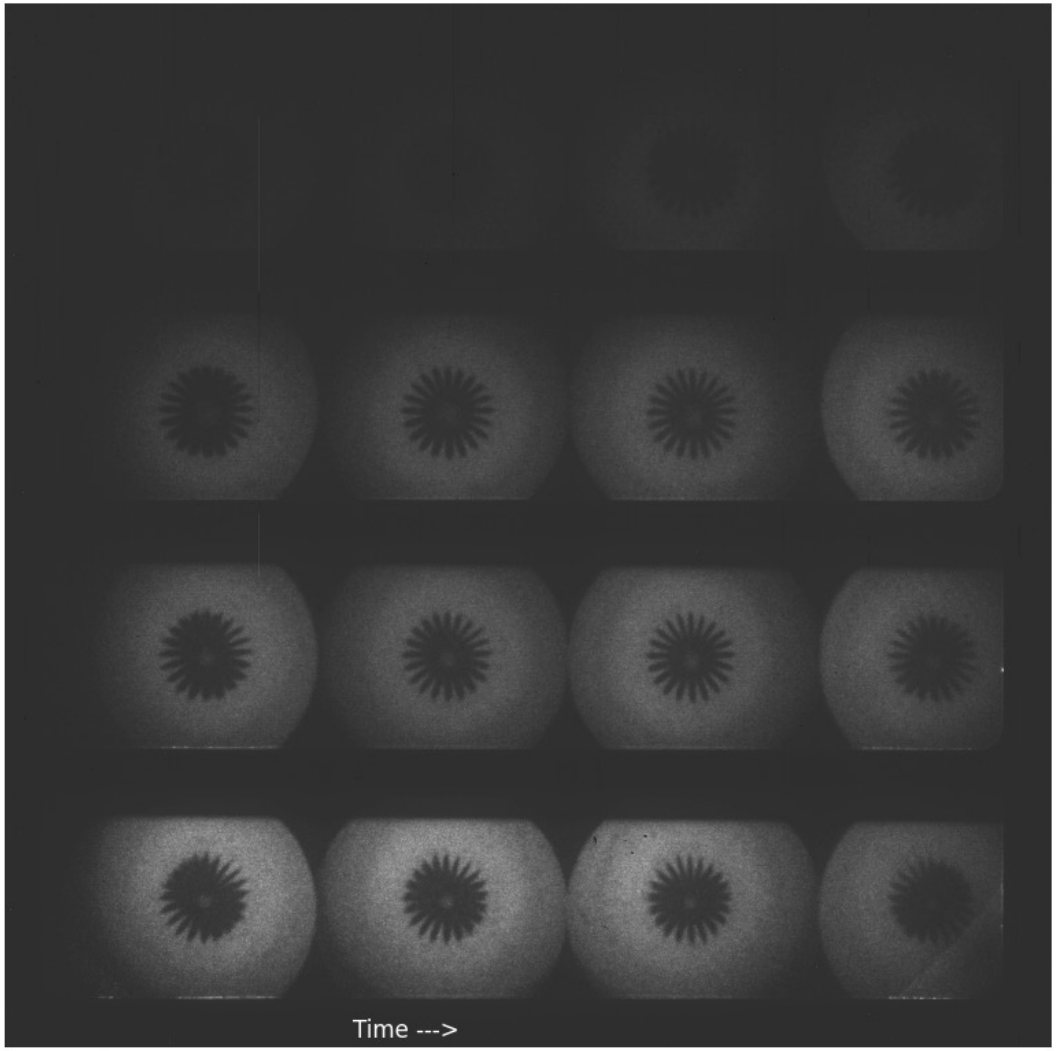
Shot 104428 – target 3 pink (SL target 11 silver), avg drive energy 432.8 J on target



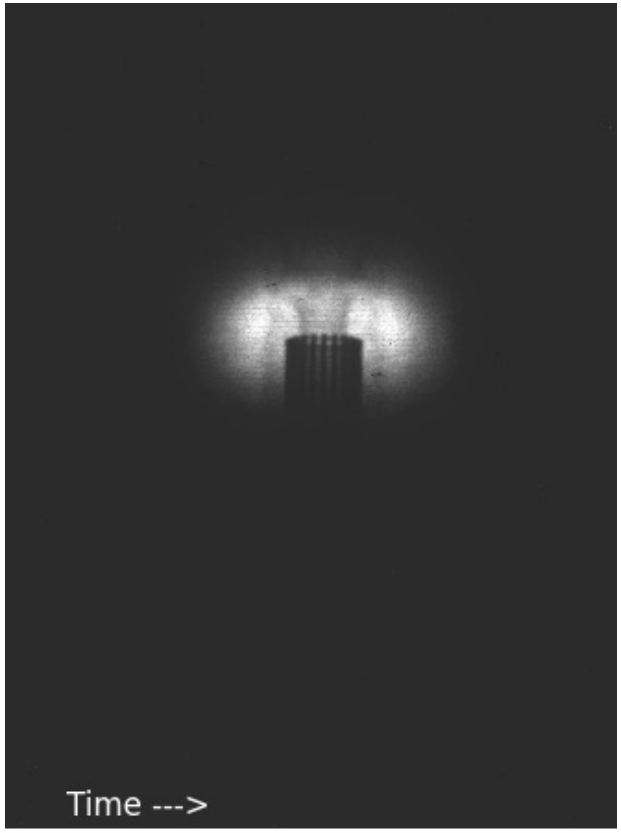

Timing: 4.0 – 5.0 ns


Timing: 4.5 ns

Shot 104429 – target 1 red (SL target 12 silver), avg drive energy 431.4 J on target

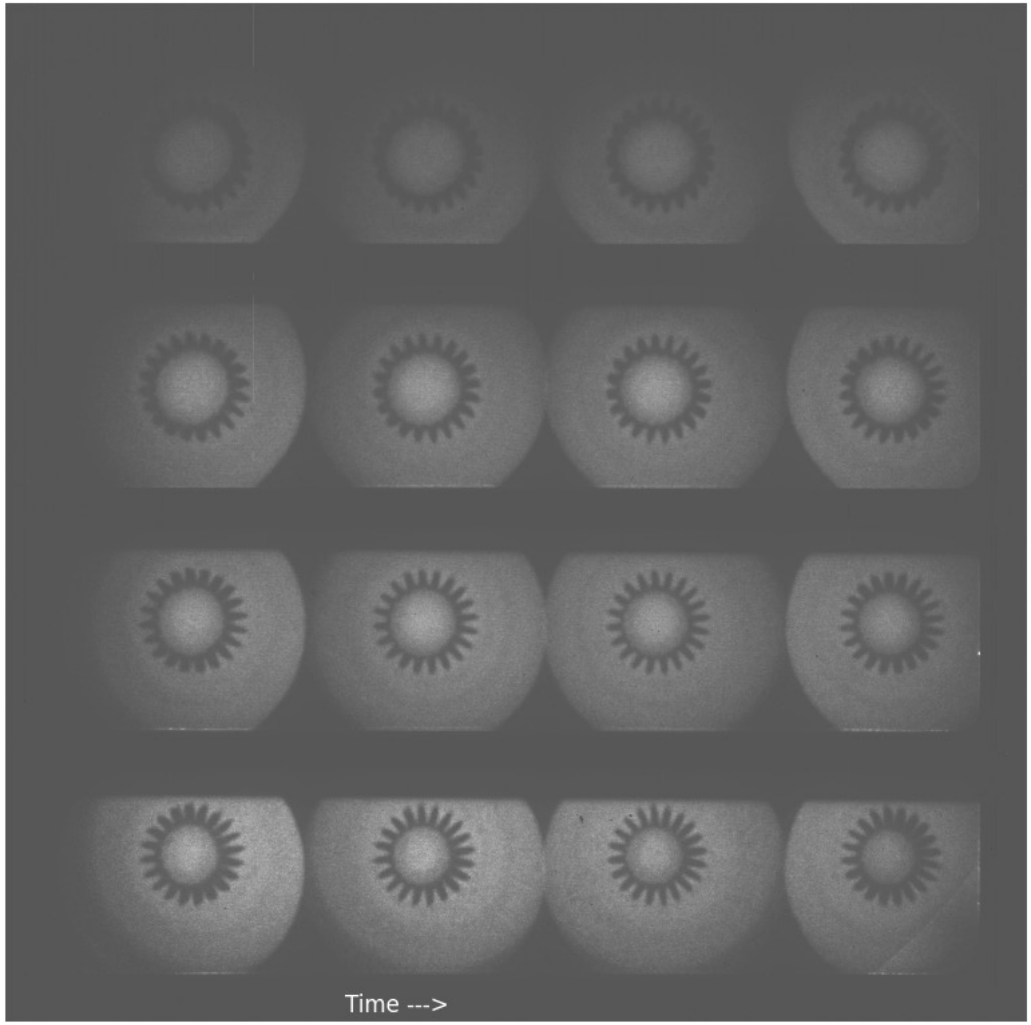



Timing: 5.0 – 6.0 ns

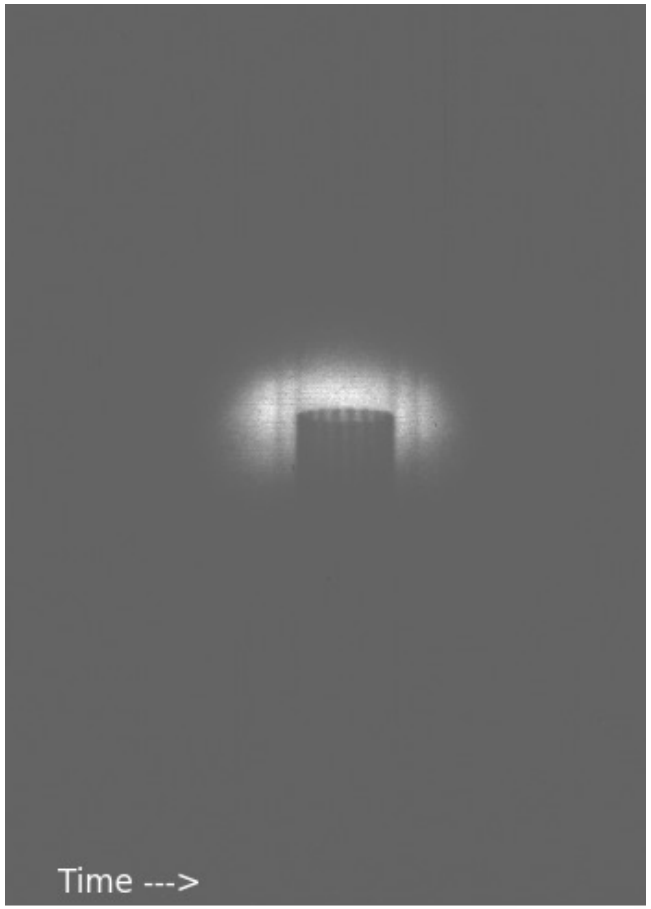



Timing: 3.5 ns

Shot 104430 – target 4 red (SL target 13 silver),
avg drive energy 435.2 J on target




Timing: 3.5 – 4.5 ns




Timing: 2.0 ns